



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

March 25, 1998

MEMORANDUM

SUBJECT: Review of Disulfoton Incident Reports  
DP Barcode D243921, Chemical #032501, Reregistration  
Case #0102

FROM: Jerome Blondell, Ph.D., Health Statistician  
Chemistry and Exposure Branch 2  
Health Effects Division (7509C)

Monica F. Spann, M.P.H., Environmental Health Scientist  
Chemistry and Exposure Branch 2  
Health Effects Division (7509C)

THRU: Susan V. Hummel, Senior Scientist  
Chemistry and Exposure Branch 2  
Health Effects Division (7509C)

TO: Jonathan Becker, Environmental Health Specialist  
Reregistration Branch 2  
Health Effects Division (7509C)

BACKGROUND

The following data bases have been consulted for the poisoning incident data on the active ingredient Disulfoton (PC Code: 032501):

1) OPP Incident Data System (IDS) - reports of incidents from various sources, including registrants, other federal and state health and environmental agencies and individual consumers, submitted to OPP since 1992. Reports submitted to the Incident Data System represent anecdotal reports or allegations only, unless otherwise stated. Typically no conclusions can be drawn implicating the pesticide as a cause of any of the reported health effects. Nevertheless, sometimes with enough cases and/or enough documentation risk mitigation measures may be suggested.

2) Poison Control Centers - as the result of Data-Call-Ins issued in 1993, OPP received Poison Control Center data covering the years 1985 through 1992 for 28 organophosphate and carbamate chemicals. Most of the national Poison Control Centers (PCCs) participate in a national data collection system, the Toxic Exposure Surveillance System which obtains data from about 70 centers at hospitals and universities. PCCs provide telephone consultation for individuals and health care providers on suspected poisonings, involving drugs, household products, pesticides, etc.

3) California Department of Food and Agriculture (replaced by the Department of Pesticide Regulation in 1991) - California has collected uniform data on suspected pesticide poisonings since 1982. Physicians are required, by statute, to report to their local health officer all occurrences of illness suspected of being related to exposure to pesticides. The majority of the incidents involve workers. Information on exposure (worker activity), type of illness (systemic, eye, skin, eye/skin and respiratory), likelihood of a causal relationship, and number of days off work and in the hospital are provided.

4) National Pesticide Telecommunications Network (NPTN) - NPTN is a toll-free information service supported by OPP. A ranking of the top 200 active ingredients for which telephone calls were received during calendar years 1984-1991, inclusive has been prepared. The total number of calls was tabulated for the categories human incidents, animal incidents, calls for information, and others.

#### DISULFOTON REVIEW

##### I. Incident Data System

Please note that the following cases from the IDS do not have documentation confirming exposure or health effects unless otherwise noted.

Incident#975-8

A pesticide incident occurred in 1994, when an individual ingested disulfoton and experienced diarrhea, ataxia, and tremors. No further information on the disposition of the case was reported.

Incident#999-104

A pesticide incident occurred in 1994, when an individual inhaled disulfoton and experienced respiratory symptoms. No further information on the disposition of the case was reported.

Incident#1097-1

A pesticide incident occurred in 1994, when a two and a half year old girl opened a product's package and put the product in her mouth. Specific symptoms were not mentioned. No further information on the disposition of the case was reported.

Incident#1358-1

A pesticide incident occurred in 1994, when an individual ingested disulfoton and experienced dizziness. No further information on the disposition of the case was reported.

Incident#3224-1

A pesticide incident occurred in 1996, when a thirty-five year old man was charged with murdering his six year old daughter and poisoning his estranged girlfriend and his two other children with disulfoton that was placed in their home. No further information on the disposition of the case was reported.

Incident#3768-1

A pesticide incident occurred in 1996, when a woman inhaled disulfoton that she had worked into the ground in the soil and experienced a sore throat and red bumps on her throat. No further information on the disposition of the case was reported.

Incident#5810-1

A pesticide incident occurred in 1997, when a farmer used disulfoton while planting cotton seeds about four years ago and experienced peripheral neuropathy, lung problems, short-term memory, a hemorrhaging stomach, and pain in his legs and knees. No further information on the disposition of the case was reported.

Incident#6248-1

A pesticide incident occurred in 1997, when a father and his son applied disulfoton to birch trees eight to ten years earlier. The son experienced arthralgia and myalgia. No further information on the disposition of the case was reported.

## II. Poison Control Center Data

Disulfoton was one of 28 chemicals for which Poison Control Center (PCC) data were requested. The following text and statistics are taken from an analysis of these data; see December 5, 1994 memo from Jerome Blondell to Joshua First.

The 28 chemicals were ranked using three types of measures: (A) number and percent occupational and non-occupational adult exposures reported to PCCs requiring treatment, hospitalization, displaying symptoms or serious life-threatening effects; (B) California data for handlers and field workers comparing number of agricultural poisonings to reported applications; and (C) ratios of poisonings and hospitalization for PCC cases to estimated pounds reported in agriculture for pesticides used primarily in agriculture.

#### A. Occupational and Non-occupational Exposure

There were a total of 1301 disulfoton cases in the PCC data base. Of these, 59 cases were occupational exposure; 48 (81.4%) involved exposure to disulfoton alone and 11 (18.6%) involved exposure to multiple chemicals, including disulfoton. There were a total of 499 adult non-occupational exposures; 468 (93.8%) involved this chemical alone and 31 (6.2%) were attributed to multiple chemicals.<sup>1</sup>

In this analysis, four measures of hazard were developed based on the Poison Control Center data, as listed below.

1. Percent of all accidental cases that were seen in or referred to a health care facility (HCF).
2. Percent of these cases (seen in or referred to HCF) that were admitted for medical care.
3. Percent of cases reporting symptoms based on just those cases where the medical outcome could be determined.
4. Percent of those cases that had a major medical outcome which could be defined as life-threatening or resulting in permanent disability.

Exposure to disulfoton alone or in combination with other chemicals was evaluated for each of these categories, giving a total of 8 measures. A ranking of the 28 chemicals was done based on these measures with the lowest number being the most frequently implicated in adverse effects. Table 1 presents the analyses for occupational and non-occupational exposures.

Table 1: Measures of Risk From Occupational and Non-occupational Exposure to Disulfoton Using Poison Control Center Data from 1985-

---

<sup>1</sup> Workers who were indirectly exposed (not handlers) were classified as non-occupational cases.

1992<sup>a</sup>

	Occupational Exposure	Non-occupational Exposure
Percent Seen in HCF		
Single chemical exposure	62.5 (68.2)	23.9 (44.0)
Multiple chemical exposure	67.8 (69.8)	24.6 (46.1)
Percent Hospitalized		
Single chemical exposure	26.7* <sup>3</sup> (12.2)	4.5 (9.9)
Multiple chemical exposure	27.5* <sup>3</sup> (14.3)	6.5 (12.6)
Percent with Symptoms		
Single chemical exposure	87.9* <sup>7</sup> (85.8)	59.2 (74.0)
Multiple chemical exposure	90.2* <sup>6</sup> (85.8)	62.1 (75.2)
Percent with Life-threatening Symptoms		
Single chemical exposure	3.0* <sup>4</sup> (0.0)	0.0 (0.0)
Multiple chemical exposure	2.4* <sup>5</sup> (0.5)	0.0 (0.05)

a Extracted from Tables 2, 3, 5 and 6 in December 5, 1994 memo from Jerome Blondell to Joshua First; number in parentheses is median score for that category.

\* Top 25% of chemicals are ranked with a superscript of 1 to 7

Disulfoton had the third highest percent hospitalized for occupational cases. On life-threatening symptoms, disulfoton had the fourth highest percent for a single chemical exposure and fifth highest percent for multiple chemical exposure for occupational cases. However, these percentages were based on one life-threatening case. On percent with symptoms, disulfoton had the sixth highest percent for multiple chemical exposure and seventh highest percent for single chemical exposure for occupational cases. Among non-occupational cases with sufficient numbers reported, disulfoton did not rank in the top 25% on any of the measures.

#### B. Ratios of poisoning - California Data

The incidence of **systemic poisoning cases** in agricultural workers reported to the California was compared to the number of applications of disulfoton. Those calculations, along with the median score for a total of 29 pesticides, are presented in the

Table 2 below.

Table 2: Systemic Poisonings/1,000 Applications in Selected Agricultural Workers Exposed to Disulfoton in California, 1982-1989<sup>a</sup>

Pesticide	Number of Appl.	Poisonings/1,000 Appl. (N) Primary Pesticide Only			Poisonings/1,000 Appl. (N) Multiple Pesticide Exposure		
		Handlers	Field Workers	Total	Handlers	Field Workers	Total
Disulfoton	31,226	.13 (4)	.10 (3)	.22 (7)	.26 (8)	.13 (4)	.38 (12)
Median		.21	.20	.41	.44	.50	1.02

<sup>a</sup> Extracted from Table A5 in December 5, 1994 memo from Jerome Blondell to Joshua First; number in parentheses is the observed number of poisoned cases.

Disulfoton had the eleventh highest ratio of field worker poisonings per 1,000 applications in California when exposures to mixtures were included and when mixtures were excluded (See Table 7 in the December 5, 1994 memo.)

### C. Exposure in Children

A separate analysis of the number of exposures in children five years of age and under from 1985-1992 was conducted. For disulfoton, there were 743 incidents; 679 involved exposure to disulfoton alone and 64 involved other pesticides as well. Compared to 14 other organophosphates and carbamates that 25 or more children were exposed to, disulfoton cases were less than half as likely to be seen in a health care facility or require hospitalization. Symptoms also occurred less often for disulfoton, but there were two life-threatening cases reported in children under age six.

### III. California Data - 1982 through 1995

Detailed descriptions of 29 cases submitted to the California Pesticide Illness Surveillance Program (1982-1995) were reviewed. In 18 of these cases, disulfoton was used alone and was judged to be responsible for the health effects. Only cases with a definite,

probable or possible relationship were reviewed. Disulfoton ranked 60th as a cause of systemic poisoning in California. Two individuals were hospitalized between 1982 and 1995. Table 1 presents the types of illnesses reported by year. Table 2 gives the total number of workers that took time off work as a result of their illness and how many were hospitalized and for how long.

Table 1: Cases Due to Disulfoton Exposure in California Reported by Type of Illness and Year, 1982-1995

Year	Illness Type					
	Systemic <sup>a</sup>	Eye	Skin	Resp	Combination <sup>b</sup>	Total
1982	1	-	-	-	-	1
1983	3	-	-	-	-	3
1984	2	-	-	-	-	2
1985	2	-	-	-	-	2
1986	-	-	-	-	-	-
1987	-	-	-	-	-	-
1988	-	-	-	-	-	-
1989	-	-	-	-	-	-
1990	1	-	-	-	-	1
1991	2	-	-	-	-	2
1992	2	1	-	-	-	3
1993	-	1	1	-	-	2
1994	2	-	-	-	-	2
1995	-	-	-	-	-	-
Total	15	2	1	-	-	18

<sup>a</sup> Category includes cases where skin, eye, or respiratory effects were also reported

<sup>b</sup> Category includes combined irritative effects to eye, skin, and

respiratory system

Table 2: Number of Persons Disabled (taking time off work) or Hospitalized for Indicated Number of Days After Disulfoton Exposure in California, 1982-1995.

	Number of Persons Disabled	Number of Persons Hospitalized
One day	2	-
Two days	1	-
3-5 days	2	1
6-10 days	1	-
more than 10 days	-	1
Unknown	1	-

A total of 15 persons had systemic illnesses or 83.3% of 18 persons. A total of 2 persons had eye illnesses or 13.3% of 18 persons. A variety of worker activities were associated with exposure to disulfoton as illustrated in Table 3 below.

Table 3: Illnesses by Activity Categories for Disulfoton Exposure in California, 1982-1995

Activity Category <sup>a</sup>	Illness Category					
	Systemic <sup>b</sup>	Eye	Skin	Resp	Combination <sup>c</sup>	Total
Application	4	-	1	-	-	5
Coinciden	3	-	-	-	-	3
Driftexp	1	-	-	-	-	1
Mixing/Loading	3	1	-	-	-	4
Othernon	4	1	-	-	-	5
Total	15	2	1	-	-	18

<sup>a</sup> Coinciden= coincidental; Driftexp= exposure to pesticide that has drifted from intended targets; Othernon= non-occupational exposure

<sup>b</sup> Category includes cases where skin, eye, or respiratory effects were also reported

<sup>c</sup> Category includes combined irritative effects to eye, skin, and



respiratory system

According to the above activity categories, application and mixing/loading were associated with the majority of the exposures. These illnesses included symptoms of weakness, nausea, blurred vision, body aches, and twitching eyes.

#### IV. NPTN

On the list of the top 200 chemicals for which NPTN received calls from 1984-1991 inclusively, disulfoton was ranked 55th with 68 incidents in humans reported and 22 incidents in animals (mostly pets).

#### V. Conclusions

In California, disulfoton had the eleventh highest ratio (1982-1989) for cases when the pesticide was considered the primary cause of poisoning of fieldworkers per 1,000 applications. Disulfoton ranked third on percentage of occupational PCC cases requiring hospitalization and fourth on percentage of occupational cases with life-threatening symptoms.

#### VI. Recommendations

Measures to reduce risk to applicators and handlers of disulfoton should be consistent with other organophosphate and carbamates.

cc: Correspondence  
Disulfoton file (chemical no. 032501)  
SRRD - Dana Lateulere

RDI: BRSrSci:SHummel: